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Dr. Hosterman PHYS 261 HW
HW Assignment No. 1
8-22-17

4/4

Ex 1.1

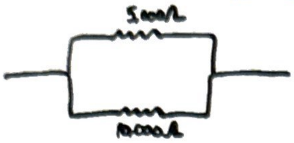
✓

a.) Series connection $R = R_1 + R_2$

$\boxed{\text{Series conn } R = 15K\,\Omega}$

$R_{Eq} = R_1 + R_2 : 5000 + 10,000 = 15,000\,\Omega$

b.) Parallel connection $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$



$\frac{1}{R} = \frac{1}{5000\Omega} + \frac{1}{10,000\Omega} = \frac{3}{10,000\,\Omega}$

$\frac{1}{R} = \frac{3}{10,000\,\Omega} \;:\; R = 3,333.33\,\Omega$ ✓

$\boxed{\text{Parallel connection } R = 3,333.33\,\Omega}$

Ex 1.2

$R = 1\Omega$
$V = 12V$

$P = IV = I^2R = V^2/R$

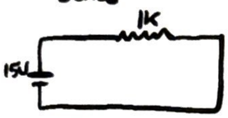
$P = V^2/R = \frac{(12v)^2}{1\Omega} = 144\,W$

$\boxed{P = 144W}$ ✓

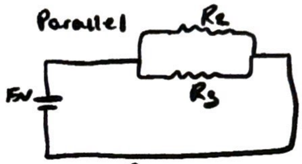
Ex 1.5

$P = 1/4\,W$
$R \leq 1000\,\Omega$
$V = 15v$

Series



Parallel



$R_1 = 1000\,\Omega$
$R_1 = \left(\frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$

$P = V^2/R$ $V = 15V$ $R = 1000\Omega$

$P = \frac{225V}{1000\Omega} = 0.225\,W$

$P = V^2/R$
$V = 15v$
$R = 1000\Omega$

$P = \frac{225V}{1000\,\Omega} = 0.225W$ ✓

$0.225W = 0.225W \;:\; 0.225W < 0.25W$

Power rating

Since both methods of connecting resistors yields the same Resistance, and that Resistance of 1K, yielded watts less than the maximum.

$0.225 < 0.25 \therefore$ $\boxed{\text{It does not matter how you connect them}}$

Ex 1.6

$P = 10^{10}\,W$
$V = 115\,V$
$R = 0.05 \times 10^{-6}\,\Omega$
$d = 1\,ft$

a.) $P = IV$ $\quad P = 10^{10}\,W$
$P = I^2R$ $\quad V = 115\,V$
$P = V^2/R$

$P = IV$
$I = P/V$
$= 10^{10}/115 = 8.70 \times 10^7\,A$

$I = 8.70 \times 10^7\,A$

Power lost per square foot
$P = I^2R$
$I = 8.70 \times 10^7\,A$ $\quad P = (8.7 \times 10^7\,A)^2 (5.0 \times 10^{-8})$
$R = 5.0 \times 10^{-8}\,\Omega$ $\quad P = 4.34\,W/ft$

$(10^7)^2\,10^{-6}$

$P = 4.34\,W/ft$ lost

b.) 10^{10} watts $\quad$ Power lost per foot $= 4.34\,W/ft$

$L = 7.02 \times 10^8\,m$

$10^{10}\,W : 4.34\,W/ft$

$$\frac{10^{10}\,W}{4.34\,W/ft} = \frac{10^{10}}{4.34/ft} = \frac{10^{10}}{4.34}\,ft = 2.30 \times 10^9\,ft$$

c.) $\sigma = 6 \times 10^{-12}\,W/K^4 cm^2$

$d = 3.12\,m$
$d = 312\,cm$
$r = 156\,cm$

$A = \pi r^2$
$= \pi (156\,cm)^2$
$A = 76{,}453.8\,cm^2$

$A\sigma : 76{,}453.8\,cm^2 \cdot 6.0 \times 10^{-12}\,W/K^4 cm^2$
$4.59 \times 10^{-7}\,W/K^4$

$10^{10}\,W \quad 4.59 \times 10^{-7}\,W/K^4$

$$\frac{10^{10}\,W}{4.59 \times 10^{-7}\,W/K^4} = 2.18 \times 10^{16}\,K^4$$

$$\sqrt[4]{2.18 \times 10^{16}} = 12{,}149.2\,K$$

$F = K \cdot 9/5 - 459.67$
$= 12{,}149.2^\circ \cdot 9/5 - 459.67^\circ$
$F = 21{,}408.8^\circ$

$T = 21{,}408.8^\circ F$
This is irrational because the copper wire would melt. They decrease the length of the wires to solve this.